Developing Your Own Field Investigation Kits

Developed by Educators at Virginia
Department of Game and Inland Fisheries and Department of Forestry

Why have students learn outside? There is no better location to learn about the biotic and abiotic factors of our environment than outside! Outdoor field experiences provide students with an authentic context for their learning. Getting students outside to study their environment also can increase engagement in learning and develop critical thinking, collaboration, and creative thinking skills.

Field investigation tips. The most valuable field investigations are those done over time (more than one class period); this provides students with ample time to collect their own data, to see how the data may change over time, and gives them an authentic context to help them interpret the data and discuss what it means. Data collected at the same location and same time over several years provides an opportunity to examine data trends or to observe changes. If you are using your schoolyard for investigations, consider collecting the same information each season, at different times of day, and under different weather conditions. For example, you can decide that the class will collect weather data on the second Tuesday of odd number months and every hour of that school day.

If any collecting is to be done, it should begin with a respect for the environment and the organisms you are collecting. Obviously, any collecting for instructional purposes should alter the environment as little as possible and should not significantly damage wildlife or their habitats. Where possible, anything collected should be returned to its original location at the conclusion of the activity. Check with your school system for any additional regulations.

Field investigation supplies. Many field investigations will only need a minimal amount of equipment that can be easily put together even on a tight budget. These Terrestrial and Aquatic Field investigation Kits are comprised of free or inexpensive items that can be easily gathered and are tailored to the schoolyard and the type of investigations students will be doing. There are some items that each small group needs and others that may be shared. Directions for making some of the equipment and resources for planning field investigations are included at the end of this handout.

We suggest you use a 5 gallon bucket to hold the materials; an alternative is a plastic bin. Consider making several kits so students can work in small groups. Buckets with lids or rectangular bins stack easily in a corner of the classroom. Buckets and lids or plastic bins can be purchased at most hardware stores for just over $5.00 or you can use recycled buckets that once held kitty litter, laundry detergent or other non-toxic materials.

The most important consideration in putting together any field investigation kit is not to forget a small **First Aid Kit** for the class. The teacher also should have a way of contacting help if needed.

Terrestrial Field Investigations

Schoolyards provide a wealth of opportunities for investigating without ever leaving the school site. Most schools have some landscaping from bushes and flower gardens to large trees. Even if a school currently doesn't have much more than lawn, students can find an abundance of different weeds mixed in with the grass and a variety of invertebrates that live there. If you can get to a park or other natural area there will be an even greater diversity of plants, animals and ecosystems. Developing the question you want to investigate is the first step, having equipment on hand and ready to go is the next.

Terrestrial Field Investigation Kit contents:

- Biodiversity research frames or quadrats (directions below)
- Field guides are available for a wide variety of organisms. Choice of guides depends on what you are planning to investigate. See Resources for suggestions for purchasing or downloading inexpensive field guides.
- Small net for capturing spiders, crickets and other small invertebrates in the grass, a 4-5 inch aquarium net works well
- Seed collecting wands (directions below)
- T-shirt sweep nets for collecting insects (directions below)
- Magnifiers (such as hand lenses or fold-out magnifiers) and bug boxes
- Large tweezers
- Small trowel and/or hand rake
- Small terrarium to temporarily hold a toad or other small animal for observation
- Tape measures - assorted lengths and types
- Ruler (flexible plastic 6 and/or 12 inch ones work well)
- Misting bottle with water to mist items for closer study with magnifiers
- Thermometers (air and soil)
- Soil probe – at least one for class use (Check for underground wires, pipes, etc.)
- Garden shears for cutting samples of different plants.
- Clip board to hold data sheets

Central Elementary School Gardens

Aquatic Field Investigations

There are many investigations that can be done in a stream, pond or other body of water. We all need water to thrive and the quality of our water affects all plant and animal life on our planet. Water quality test kits are available from multiple sources to do basic water chemistry. Macro-invertebrates are good indicators of water quality. The type of species found will indicate the health of the water system.

Aquatic Field Investigation Kit contents:

- Leaf pack bags – use the bags that onions come in or purchase inexpensive lingerie bags
- Two way viewer - allows you to see top and bottom of insects www.nature-watch.com
- Bug boxes and other magnifiers (such as hand lenses or fold-out magnifiers)
- 2 -3 white ice cube trays for sorting insect types
- White dishpans to empty leaf packs into
- Minnow trap (**need fishing license to use**)
- 50 foot rope and tent stake to tie the leaf pack or minnow trap to shore
- Small aquarium net
- Laminated SOS cards or macro-invertebrate ID Cards
- Small paint brushes or tweezers to lift bugs from leaf debris
- White plastic table cloth, shower curtain or white flat sheet to work on when sorting insects; can be divided into quarters
- Spray bottle – misting helps to release tiny macros from leaves
- 25 – 50 foot tape measure to determine water velocity (field measuring tape) OR make your own by taking heavy cord (orange is easily seen in the water) and marking distances on the cord
- Tennis ball, an orange or an apple to determine water velocity
- Stop watch to determine water velocity (a cell phone clock should have a stopwatch feature)
- Secchi disk or Turbidity tube to determine water clarity (See Resources for link to make)
- Yard or meter sticks to determine depth in streams
- Aquatic thermometer
- Water test kit available on-line (see Resources for suggestions)
- Clip board to hold data sheets (a piece of clear plastic cut to the size of the board will help protect data sheets from water)
- Macroinvertebrate identification cards; free to download: http://www.edengelman.com/MacroCards/AllMacroCards2016.pdf
- Macroinvertebrate identification dichotomous key, laminated; free to download at: watermonitoring.uwex.edu/pdf/level1/riverkey.pdf
- Disposable gloves & a heavy duty garbage bag (to pick up trash at the site)

Notes:

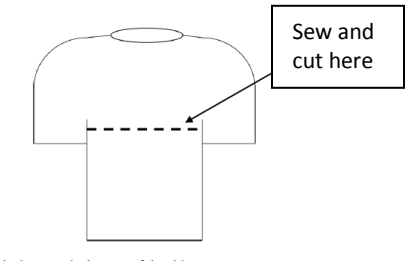
- A Virginia Fishing License is required to set a minnow trap www.dgif.virginia.gov
- A scientific collecting permit is required to sample aquatic macro-invertebrates. See www.dgif.virginia.gov/forms/ No permit needed if use Leaf Packs.
- Guidelines for wildlife in the classroom can be found at DGIF Guidelines

DO IT YOURSELF DIRECTIONS

Directions to Make a Sweep Net for Capturing Terrestrial Insects

A sweep net can be used to collect insects in tall grass along a fence or in a field.
These instructions are for making a sweep net from a large white t- shirt and a coat hanger.

SUPPLIES NEEDED (for each sweep net)**:**
1 old, youth large white t-shirt (shirt should not have any holes)
1 wire coat hanger
1 pair of pliers to open and bend the coat hanger
1 large sewing needle
Heavy duty thread for sewing
Duct tape



DIRECTIONS:
1. With needle and thread, sew tight, close running stitches across the shirt just below armpits (see picture). Cut off the arm and neck section just above your stitching and this will give you what looks like a bag. Make sure your sewing is tight enough that small insects cannot fall or crawl through.
2. Make a small cut in the hem on the bottom of the shirt.
3. Unbend the coat hanger.
4. Thread the coat hanger through the hem.
5. When the coat hanger is threaded through the entire hem of the shirt, re-twist the ends together. This will become the handle of your sweep net.
6. Cover the end of the wire coat hanger that is now the handle with duct tape to cover any sharp edges.
7. To use, sweep the net through tall grass or weeds to collect insects. Take a look inside and you will see what you caught easily against the white background of the shirt.

Directions for Making a Seed Wand for Collecting Seeds

A seed wand allows students to collect a variety of seeds that are found along edges of fields. Not all types of seeds can be collected this way, but for small seeds or seeds that are out of reach, it is the easiest method. You will need a pair of tweezers and a small container to put the seeds in once collected.

SUPPLIES NEEDED (for each wand)**:**
- Microfiber cleaning cloth
- Rubber bands
- Dowel or found stick about 2-3 feet long

DIRECTIONS:
1. Wrap the microfiber cloth around one end of the dowel or stick.
2. Secure with rubber bands.
3. Wave the wand through tall weeds or grasses.
4. Remove seeds with a pair of tweezers and sort according to type.

Directions for Making a Biodiversity Research Frame

Collecting data for every plant and animal that live around your entire schoolyard is virtually impossible and much too time consuming. Scientists collect data in smaller units (called samples) and then estimate the total number based on the possible number of units in the area being researched. There are many methods for collecting data in small units. One method is to use hula hoops which when rolled or thrown provide a semi-random sampling method.

You can also make a square frame using yard or meter sticks. Each small group of students can survey a different section of the school yard. If you are looking for insects and other animal life we suggest you conduct the survey several times, varying the season and time of day in order to get a clearer picture of animal life in the schoolyard.

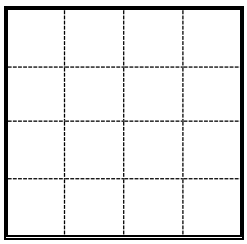
Directions can be found online for making a biodiversity research frame or sampling quadrat out of PVC pipe. This is a method for sampling vegetation cover types along a transect.

SUPPLIES NEEDED (for one set or frame)**:**

- 4 meter or yard sticks (for smaller frames use 30 cm rulers)
- Braided nylon string (melt ends using a candle)
- Pony beads, washers or paper clips to keep string from slipping back through the holes
- Drill

DIRECTIONS:

1. Drill evenly spaced holes in each stick large enough to put the string through.
   For example: if you want a 10 x10 grid then drill a hole every 10 centimeters.
2. Cut the string slightly longer than the length of the stick. You will need enough string to go through the hole and be tied to the bead or washer and then through the hole of the opposite stick and be tied to another bead.
3. Repeat for the number of grids you want to have in the frame.
4. To use the frame lay down two of the sticks in the grass and stretch tight; lay the other two sticks across the first two to form a series of grids.
5. Survey the life in each grid or a random set of grids in the frame.



Other Resources:

North American Conservation Education Toolkit: Field Investigation and other guides developed to help educators explore the environment thru scientific investigations. The Toolkit can be downloaded free at North American Conservation Education Strategy

Wonders of Wetlands: Has a chapter on making sampling equipment as well as thorough background information and activities. Available from www.ProjectWET.org
Click on **Store** at top of landing page.

Native Tree, Shrub and Vine guides from the VA Dept. of Forestry www.dof.virginia.gov may be purchased or downloaded for free.

Virginia Native Plant Society: https://vnps.org/ has several regional native plant guides (click on *Growing Natives*) along with information for the *Flora of Virginia* app

Snake, Lizard, Turtle, and Frog and Toad identification guides can be purchased from Department of Game & Inland Fisheries www.shopdgif.com

Virginia Save Our Streams: http://www.vasos.org/ The Virginia SOS website is packed with water quality monitoring information, especially for macroinvertebrates. The Stream Insects and Crustaceans ID Cards are located at
http://www.vasos.org/images/stories/docs/ModifiedBugIDCardoct2004.pdf

Leaf Pack Project: http://www.stroudcenter.org/lpn/resources/equipment.shtm The Leaf Pack project offers a method of studying macroinvertebrates in the classroom. Data sheets and other activities are available.

Hoosier Riverwatch Volunteer Stream Monitoring Training Manual:
https://www.in.gov/idem/riverwatch/2332.htm

Key to Life in the Pond: http://watermonitoring.uwex.edu/pdf/level1/pondkey.pdf

Key to Life in the River: http://watermonitoring.uwex.edu/pdf/level1/riverkey.pdf

Earth Force® Low-Cost Water Quality Monitoring Kit: available from many sources on the web.

Underwater Viewer: There are multiple sites with instructions to make inexpensive and simple viewers if you search the internet. This will allow you to clearly see the stream bottom. Key words "instructions for underwater viewer".

Turbidity Tube: Directions for making a turbidity tube.
http://www.virginia.edu/blandy/blandy_web/education/Bay/TurbidityTubeConstruction&Use_Myre_Shaw.pdf

Cloud identification chart: download for free at: https://science-edu.larc.nasa.gov/cloud_chart/

Topographic map of field site: download for free from: https://store.usgs.gov/map-locator

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